MEASURING THE IMPACTS OF PRIME-AGE ADULT DEATH ON RURAL HOUSEHOLDS IN KENYA

Takashi Yamano*
Foundation for Advanced Studies on International Development (FASID), Japan

T. S. Jayne
Michigan State University

Melody McNeil
Bread for the World

October 2002

* Corresponding Author for the IAAE conference:

Takashi Yamano
GRIPS / FASID Joint Graduate Program
2-2 Wakamatsu-cho, Shijuku-ku,
Tokyo 162-8677, JAPAN
Tel: 81-3-3341-0696
Fax: 81-3-3341-0220
Email: yamanota@grips.ac.jp

Acknowledgements: Support for this research has been provided by the Kenya Mission of the United States Agency for International Development under the Tegemeo Agricultural Monitoring and Policy Analysis Project. Secondary support was provided by the Food Security II Cooperative Agreement (PCE-A-00-97-00044-00) between AID/Global Bureau, Office of Agriculture and Food Security, and the Department of Agricultural Economics at Michigan State University. The Agriculture, Natural Resources and Rural Enterprise Division, Office of Sustainable Development, Bureau for Africa, USAID (AFR/SD/ANRE) also supported this work. The authors thank Kathleen Beegle, Gretchen Birbeck, Amy Damon, Yoko Kijima, Mattias Lundberg, Kaoru Nabeshima, Jennifer Olson, Keijiro Otsuka, James Shaffer, John Strauss, Michael Weber, and Kim Witte for comments on an earlier draft of the paper.

Measuring the Impacts of Prime-Age Adult Death on Rural Households in Kenya

Abstract

Using a two-year panel of 1,422 Kenyan households surveyed in 1997 and 2000, we measure how prime-age adult mortality affects rural household' size and composition, agricultural production, asset levels, and off-farm income. We find that the effects of adult mortality are highly sensitive to the gender and position of the deceased family member in the household. Female head-of-household or spouse mortality causes a large decline in cereal area cultivated, while cash crops are most adversely affected by the mortality of a prime-age male member. Households seem to cope with prime-age adult mortality by selling mainly small animals. Off-farm income is also significantly affected by the death of the male head of household, but not in the case of other adult members.

Key words: HIV/AIDS, adult mortality, household composition, coping mechanism, Kenya
Eligible for Young Economist Competition

1. INTRODUCTION

Development planners increasingly require solid information on how the death of adults in their prime productive years affects household behavior and welfare. In parts of Africa, mortality rates in the 15-54 year age cohort have risen dramatically since the onset of HIV/AIDS. There is widespread agreement that this unprecedented humanitarian disaster will have pervasive economic and food security effects (UNAIDS/WHO, 2001).

A number of macro-studies have modeled the impact of HIV/AIDS on economic growth (e.g., Bloom and Mahal, 1997; Cuddington and Hancock, 1995). These studies, however, suffer from the paucity of quantitative micro-level information on how households respond to HIV/AIDS. It is perhaps not surprising that there remains limited survey information on the economic effects of HIV/AIDS because of the difficulty and cost of obtaining reliable clinical assessments of AIDS-related mortality and linking this to socio-economic surveys typically employed by social scientists (Urassa et al., 2001; Kahn et al., 1999; Quigley et al., 2000; Garenne et al., 2000). Because of these difficulties, the few available micro-level studies of the effects of HIV/AIDS on rural households are almost always drawn from specific geographic sites purposively chosen because they were known to have high HIV infection rates (Barnett and Blaikie, 1992; Lundberg, Over, and Mujinja, 2000; Tibaijuka, 1997). While providing valuable insights into how afflicted households respond to the disease, such studies are limited in their ability to be extrapolated in order to understand national level impacts.

An alternative and complementary approach is to focus on understanding the effects of prime-age adult mortality more generally, given the substantial AIDS-related increase over the last two decades in the proportion of African households suffering from prime-age adult mortality. The effects of adult mortality can be more readily assessed through standard nationally-representative socio-demographic and economic household surveys.

This paper estimates the impact of prime-age adult mortality on household composition, crop production, asset holdings, and non-farm income using nationwide household survey data in rural Kenya. Kenya is one of the most heavily HIV-infected countries in the world: 13.9 percent of adults aged between 15 and 49 are estimated to be living with HIV (UNAIDS/WHO, 2000). We use a two-year panel of 1,422 households in 22 districts surveyed in 1997 and 2000 to estimate household fixed-effects models of changes in outcomes.

The findings of this study highlight the importance of dis-aggregating the effects of prime-age adult death by gender and status (i.e., the role and position of the individual) within the household. We find important gender and status differences in how adult mortality affects household' size and composition, crop cultivation patterns, agricultural output, and off-farm income.

2. DATA

This paper uses a two-year panel of rural household surveys in 1997 and 2000.[1] Of the 1,500 households that we attempted to revisit in the 2000 survey, 1,422 households in six provinces in rural Kenya were located and re-interviewed (Table 1). The attrition rate is 5.2 percent. Among the 78 households that could not be re-interviewed, we obviously lack data on adult mortality. If these 78 households experienced higher mortality rates than the average, the incidence of adult mortality in this paper would be underestimated. Therefore, the results in this paper should be treated as the measured impact of prime-age adult mortality among households remaining intact after experiencing a death in the household.

In 2000, enumerators revisited households sampled in 1997 and asked for the whereabouts of each individual in the demographic roster of the 1997 survey. Out of 9,177 household members in the 1997 survey,[2] 6,856 members were identified again in the 2000 survey. Among those 6,856 individuals, 145 had passed away before the 2000 survey. The 2000 survey encountered 2,357 household members not listed in the 1997 survey. Of the 2,357 new members listed in the 2000 survey, 55 of them had passed away between the 1997 and 2000 surveys. Thus, the total number of deceased members is 200.

Of the 200 individuals in the 1,422 sampled households who had passed away between 1997 and 2000, 160 were aged 15 years and over. Nine persons died because of accidents or violence, and are excluded from the analysis. Of the remaining 151 cases attributed by respondents to disease, 76 individuals were in the conventional “prime age” categories of sexual activity (15-49 years for women and 15-54 years for men). The other 75 cases of mortality involved individuals older than these age ranges. Adult mortality information for this panel sample is summarized in Table 1.

Studies measuring HIV prevalence focus primarily on age categories of prime sexual activity. In Kenya, according to the National AIDS and STE Control Program (NASCOP, 2001), roughly 75% of AIDS cases occur in adults between 20 and 45. However, a significant proportion of AIDS cases in men occur in the 45 to 54 age range and in women in the 15-19 age range. For these reasons, we define “prime age” as 15 to 45 years for women and 15 to 54 years for men.

Standard age ranges of prime sexual activity are not perfectly correlated with the ages of prime economic productivity. Many men and women reach their period of peak economic contribution to the household after age 55. Thus, to examine the sensitivity of the results to the definition of “prime age,” we run alternate regressions based on 15-59 year age ranges for both men and women in addition to those based on the standard age ranges specified above.

3. RELATIONSHIP BETWEEN ADULT MORTALITY AND HIV/AIDS

In the period between the two surveys in 1997 and 2000, five percent of sampled households had at least one prime-age adult death (Table 1). Households in the Kisumu and Siaya districts in Nyanza province suffered the most prime-age adult deaths. Of the 177 sampled households in the Kisumu and Siaya districts, 28 households (16 percent) had at least one prime-age adult death between the 1997 and 2000 surveys. Nyanza province has the highest rates of HIV prevalence in the country (UNAIDS/WHO, 2000).

Table 1 also shows the number of adult deaths among men over 54 and women over 49. We do not find an unusually high number of deaths among this group in Kisumu and Siaya, but there is an inordinately high percentage of deaths in the standard prime-age ranges. Because sexually active adults are more likely to suffer from HIV, it appears likely that the high mortality rate among prime-age adults in Kisumu and Siaya is partially, if not primarily, due to AIDS.

In Sub-Saharan Africa, especially early in the epidemic, men and women with higher education and income were more likely than others to contract HIV (World Bank, 1999). The results from our surveys are consistent with the earlier findings to some extent. A high percentage (48.7 percent) of deceased prime-age men were found in the highest per-capita income quartile in 1997, while only 16.2 percent of other prime-age men who were still alive at the second survey were found in the same quartile.

To obtain a rough estimate of the percentage of prime-age deaths in our sample due to AIDS, we draw upon Urassa et al.'s (2001) study showing adult mortality rates among individuals known to be HIV-negative through blood testing in the Kisesa district in Tanzania from 1994-1998, and compare these age- and sex-differentiated mortality rates with those obtained in the Kenyan sample from 1997-2000. According to this procedure, we find that the number of deaths in Kisumu and Siaya districts are six to ten times higher in the 35-44 and 25-34 age groups over the 3-year survey period than those predicted on the basis of mortality rates from the HIV-negative sample from Tanzania.[3]

From this, it seems reasonable to conclude that, while epidemiological information on the cause of death among individuals in our sample is unavailable, AIDS accounts for a large proportion of the recorded deaths for particular age/sex categories, particularly in the Nyanza area. While this study is not an HIV/AIDS study *per se*, the findings are intended to contribute to our knowledge of the effects of premature adult death on rural households, in light of the growing importance of prime age adult mortality associated with the HIV/AIDS epidemic.

4. METHOD FOR ESTIMATING THE EFFECTS OF PRIME-AGE ADULT DEATH

We take a counterfactual framework approach in which each household has an outcome, either with or without treatment. The treatment group contains households experiencing at least one prime-age adult death (D), and the comparison group is comprised of households not experiencing prime-age adult deaths (N). We further stratify prime-age adult mortality by the gender of the deceased: households with a male prime-age adult death (M) and with a female prime-age adult death (F).

$$E(\delta^{M}) = E(\Delta Y^{M}{}_{D}) - E(\Delta Y_{N}) \text{ and}$$
$$E(\delta^{F}) = E(\Delta Y^{F}{}_{D}) - E(\Delta Y_{N}) \qquad (1)$$

Although the difference-in-differences in equation (1) control for group-specific characteristics and the average change in outcomes over time, there may be other area-specific time-variant effects that might be correlated with both the prime-age adult death and the outcome. To control for such area-specific time-variant effects, we estimate the following OLS model with village × time interaction dummies:

$$\Delta Y_{i} = D_{i}^{M}\,\delta^{M} + D_{i}^{F}\,\delta^{F} + D_{i}^{E}\,\delta^{E} + V\,\beta + \Delta e_{i} \qquad (2)$$

where D_i^M and D_i^F are vectors of the number of prime-age adult male and female deaths occurring between the surveys, respectively, and D_i^E is a vector of the number of elderly deaths occurring between the surveys; V is a vector of village × time dummies (to control for village-specific time-variant effects over the two survey periods); and Δe_i is the error term.

The impacts of the death of a prime-age adult may also differ depending on the status within the household of the deceased member. We might conceive of household heads and spouses as “core members” of the household, and other prime-age adults as “non-core” members. To test for the possible status-differentiated effects of adult death, we develop dummy variables that separate the effects of death between household heads and spouses (“core” members), and other prime-age members (i.e., adult sons, daughters, other relatives, and non-relatives).

Among the 39 households with male prime-age deaths, 16 of the deceased were heads of household, while the other 23 were other "non-core" adults (usually younger brothers or cousins of the household head or spouse). Among the 37 households with at least one female prime-age adult death, 7 of the deceased were heads or spouses, while the remaining 30 were other adult females.

5. RESULTS

Household Composition

Table 2 presents OLS results of equation (2). As shown in Column A, the death of a prime-age man reduces the size of the household by 0.79 persons. In contrast, the death of a prime-age woman does not reduce the size of the household significantly, but it reduces the number of women by about 0.91 persons.

Next, we stratify household members into core members (head or spouse) and non-core members (sons, daughters, relatives, and non-relatives) to explicitly examine the specific effects of different age-gender-status combinations on household composition in Columns B, D, F, H, J, and L. While the drop in the number of adult men by roughly one is largely explained by the death of the male head himself, the decline in the number of adult women may initially seem puzzling. In areas of patrilineal inheritance that characterize most of the districts in this survey, including Nyanza, the widow may be forced to return to her parents' family or village and lose her rights to the deceased husband's land (Matangadura et al., 1999; Rugalema, 1999). However, out of 22 households who lost their male heads-of-households, we found 21 wives of deceased heads still living in their households in 2000.

Another explanation is that older daughters may be married off for bride doweries in times of financial stress such as after the death of the head-of-household. Traditionally, the family of the bride acquires cattle and/or other assets as bride payment. Out of the 22 households who lost their male heads-of-household, 72.6 percent of the daughters left their households, in contrast to only 41.1 percent among households not affected by adult mortality. Of the daughters who left their households in the death-stricken families, marriage accounted for 62.5 percent of the cases according to the survey respondents. Thus it seems that the 0.59 reduction in the number of women in households incurring the death of their male head-of-household can be partially attributed to daughters getting married, and this may partially reflect a coping mechanism to acquire resources through bride doweries. This finding has been found to be consistent with the perceptions of local seminar participants in follow-up discussions of findings in Kenya.

The death of a prime-age female core member reduces the number of women by about one person (Column F), which is directly attributable to the core female's death. Additionally, her death reduces the number of boys and girls in the household each by roughly 0.6 persons, although the estimated coefficient on girls is more precisely estimated. After the death of a mother, young children may be sent to relatives' homes or schools where they might receive better care than can be provided by a now-single working father.

In general, the results in this sub-section indicate that households in rural Kenya are not able to offset their loss of adult members, especially core-members.

Cultivated Land

In regression analyses, we find that the death of a core prime-age woman decreases the size of cultivated land devoted to cereals by 1.89 acres (Table 3, Column B), consistent with Davison's (1988) and Francis' (1998) characterization of the female head-of-household as having the primary responsibility for growing the household's food supply. The death of a prime-age head decreases the size of cultivated land devoted to high-value crops by 0.77 acres (Column D). Interestingly, a prime-age male death decreases the amount of land devoted to high-value crops but increases the amount of land devoted to cereals. Thus, households seem to convert land that was formerly devoted to high-value crops to cereals. The median net return to an acre of land was 5,325 Ksh for cereals, 6,387 Ksh for root crops, and 14,400 Ksh for high-value crops. By switching from high-value crops to cereals after the death of a prime-age man, households lost about 9,075 Ksh per acre (about US$121) in net revenue.[4]

We find smaller and less significant effects on cultivated area when the adult who died was not the household head or spouse. Effects appear to be sensitive to the position of the deceased within the household.

Assets and Off-farm income

Assets can be sold to mitigate the shocks of adult mortality and other shocks. Previous studies have found a large reduction in asset holdings when households experienced adult mortality (Barnett and Blaikie, 1992). The regression results in Table 3 provide a similar picture of the negative effects of prime-age adult death on assets. The death of a prime-age head decreases the value of farm equipment by 4,977 Ksh (a 38.3 percent reduction). The sale of farm equipment after the husband's death may partially reflect men's greater use of such equipment in crop cultivation patterns. The death of a prime-age adult also induces a sell-off or consumption of small animals over time, although this effect is imprecisely measured (Column F).

To the extent possible, households appear to be trying to hold on to productive cattle, reflected by the lack of any significant negative effects in Columns E or F, while coping with the prime-age adult deaths by selling or consuming small stock. In fact, households incurring the death of a male head of household appear to gain cattle, possibly as a condolence gift from relatives or bride dowries of daughters getting married after the death of a household head, suggested by the previous results in Table 2.

Roughly 30 percent of total household income in 1997 and 2000 was derived from off-farm activities. A reduction in the number of adults in the household suggests a possible reduction in off-farm labor. The results in Table 3 indicate that only the death of a male head-of-household has significant negative effects on off-farm income. The death of a head reduces the off-farm income by 43,081 Ksh (roughly US$595), which is about 79 percent of the initial off-farm income among households who experienced the death of a prime-age man. As discussed earlier, we found that roughly half of the adult males that had passed away between 1997 and 2000 were in the highest income quartile, so it is not surprising to find relatively large income shocks arising from adult male mortality. Referring back to the findings in Table 2, we found that the death of a male head-of-household also reduces the number of adult women living in the household. Therefore, the effects of the male head's death on off-farm income may partially reflect the loss of labor of other family members, not simply that of the deceased person.

6. CONCLUSIONS

The study highlights seven major findings: First, there are important gender differences in the incidence of adult death. About half of the deceased prime-age men are in the highest per capita income quartile in the 1997 survey. Second, the prevalence of adult death is concentrated in a particular area, Nyanza Province. Third, household composition is affected in different ways depending on the gender and former position of the deceased member. Fourth, the effects of adult death on farm production are also sensitive to the gender, position, and age categorization of deceased members. For instance, the gender of the deceased adult affects the type of crop suffering a shortfall, with grain crops being adversely affected in the case of adult female mortality and “cash crops” being most adversely affected in the case of male prime-age mortality. Fifth, households seem to cope with prime-age adult death by selling particular types of assets, mainly small animals. Sixth, household off-farm income appears to suffer greatly from the death of a core prime-age male member although this effect was imprecisely estimated. Lastly, there is little indication that households are able to recover quickly from the effects of adult mortality.

The findings seem to point to the need for special assistance to households incurring the death of a relatively senior prime-age male household head. The loss of income from the cultivation of traditional cash crops was a major source of hardship for these households. By overcoming gender barriers and nurturing women farmers’ participation in extension programs, cooperatives, and other forums for learning about and participating in cash crops, the shocks to agricultural income faced by households headed by women who are recently widowed could be mitigated. Government and/or outgrower companies could organize field sessions in which experienced farmers are recruited to help teach women animal-husbandry and marketing knowledge for particular crops (Gillespie and Haddad, 2002).

The rising incidence of prime-age adult death has increased the demand for labor-saving technologies and production systems. It is possible that the rising incidence of prime-age death in rural Eastern and Southern Africa partially accounts for the increased cultivation of labor-saving crops such as cassava and sweet potato (Nweke, 2002). But this is a double-edged sword – while cassava is less labor-intensive than crops such as maize, it is also less nutritious. Certain types of “conservation farming” techniques, involving minimal tillage, may also become increasingly attractive for labor-constrained rural households. However, net returns per unit of land and labor may be a greater priority than minimizing labor input for many small farm households, even those afflicted by adult death to the extent that they can afford to hire labor. These issues must be clarified empirically to guide future agricultural research priority setting.

This paper has measured only the short-run effects of adult deaths on selected aspects of rural household welfare. The full long-run effects of adult deaths on households remain unknown and are beyond the scope of this paper. However, even the short run findings of this study reinforce the view that there is a pressing need to find ways to mitigate prime-age mortality rates and redress their effects on household livelihoods in developing countries.

REFERENCES

Ainsworth, M., Semali, I. 1995. The impact of adult deaths on household composition. Mimeo. World Bank, Washington, DC.

Barnett, T., Blaikie, P. 1992. AIDS in Africa: its present and future impact. Belhaven Press, London.

Bloom, D.E, Mahal, A.S. 1997. Does the AIDS epidemic threaten economic growth? Journal of Econometrics 77, 105-124.

Cuddington, J., Hancock, J. 1995. The Macroeconomic Impact of AIDS in Malawi: A Dualistic, Labour Surplus Economy. Journal of African Economies 4, 1-28.

Davison, J. 1988. Who owns what? Land registration and tensions in gender relations of production in Kenya. In: Davison, J. (Ed.), Agriculture, Women and Land: The African Experience, Boulder, Westview, Colorado.

Francis, E. 1998. Gender and rural livelihoods in Kenya. Journal of Development Studies 35, 72-95.

Garenne, M., Kahn, K., Tollman, S., Gear, J. 2000. Causes of death in a rural area of South Africa: An international perspective. Journal of Tropical Pediatrics 46 (June), 183-190.

Gillespie, S., Haddad, L. 2002. IFPRI 2001/2002 Annual Report Essay: Food Security as a response to AIDS. International Food Policy Research Institute, Washington DC.

Kahn, K., Tollman, S., Garenne, M., Gear, J. 1999. Who dies of what? Determining cause of death in South Africa's rural north-east. Tropical Medicine and International Health 4, 433-441.

Lundberg, M., Over, M., Mujinja, P. 2000. Sources of financial assistance for households suffering an adult death in Kagera, Tanzania. South African Journal of Economics 68, 947-984.

Mutangadura, G., Mukurazita, D., Jackson, H. 1999. A review of Household and Community Responses to the HIV/AIDS Epidemic in the Rural Areas of Sub-Saharan Africa. Draft final report submitted by SAfAIDS to UNAIDS (February).

NASCOP (National AIDS and STDs Control Programme). 2001. Estimating National HIV Prevalence in Kenya from Sentiel Surveillance Data, NASCOP, Nairobi, Kenya, June report.

Nweke, F. 2002. The Cassava Transformation. Michigan State University Press, East Lansing.

Quigley, M., Chandramohan, D., Setel, P, Binka, F, and Rodrigues, L. 2000. Validity of data-derived algorithms for ascertaining causes of adult death in two African sites using verbal autopsy. Tropical Medicine and International Health 5 (1), 33-39.

Tibaijuka, A.K. 1997. AIDS and economic welfare in peasant agriculture: case studies from Kagabiro village, Kagera region, Tanzania. World Development 25, 963-975.

Urassa, M., Boerma, J.T., Isingo, R., Ngalula, J., Ng'weshemi, J., Mwaluko, G., Zaba, B. 2001. The impact of HIV/AIDS on mortality and household mobility in rural Tanzania. AIDS, 15, 2017-2023.

UNAIDS/WHO. 2000. Kenya: Epidemiological fact sheets on HIV/AIDS and sexually transmitted infections, UNAIDS/WHO, Geneva.

UNAIDS/WHO. 2001. AIDS Epidemic Update, UNAIDS/WHO, Geneva.

World Bank. 1999. Confronting AIDS: Public priorities in a global epidemic. Revised edition. Oxford University Press, New York.

Table 1. Adult Mortality[a] by Province in Kenya

Province District	Households interviewed in 1997&2000 (A)	Households interviewed only in 1997 (B)	Households with at least one prime-age[b] adult death in 1997-2000[c] (C)	Number of deceased adults		Average age of all deceased adults (F)
				Prime-age (D)	Elderly (E)	
	- Number -	- Number -	- Number (%) -	- Number -		- Age -
Coastal	88	3	5 (6 %)	5	10	59
Eastern	233	9	8 (3 %)	8	10	59
Nyanza	262	18	30 (11 %)	32	16	43
Kisumu/Siaya	177	11	28 (16 %)	30	13	42
Kisii	85	7	2 (1 %)	2	3	51
Western	290	13	12 (4 %)	12	19	55
Central	174	7	4 (2 %)	5	6	53
Rift Valley	375	28	14 (4 %)	14	14	56
Total	1,422	78	73 (5 %)	76	75	52

Source: Tegemeo Institute (Nairobi)/Michigan State University Agricultural Monitoring and Policy Analysis Household Surveys in 1997 and 2000.
Note: (*a*) Deaths caused by accidents were not included. (*b*) Prime-age is defined as 15-49 for women and 15-54 for men. (*c*) There are three households that had more than two prime-age adult deaths. One of those three is found in Nyanza, and it had three prime-age adult deaths.

Table 2. The Impacts of Adult Mortality on Household Composition (OLS with village×time dummies)

	Δ HH Size		Δ Men 17 & older		Δ Women 17 & older		Δ Boys 6 to 16 years old		Δ Girls 6 to 16 years old		Δ Young Children 5 & younger	
Effect of Mortality of:	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Prime Age Member												
adult male	-0.794*		-0.796*		-0.138		0.212		0.001		-0.055	
	(1.97)		(4.12)		(0.69)		(1.21)		(0.01)		(0.34)	
adult female	-0.440		-0.206		-0.907*		0.314		0.046		0.320	
	(0.95)		(0.83)		(4.56)		(1.56)		(0.23)		(1.57)	
Prime Age Core Member:												
adult male head of household		-1.527*		-1.193*		-0.591*		0.268		0.102		-0.091
		(3.44)		(4.96)		(2.10)		(1.15)		(0.53)		(0.40)
adult female head or spouse		-2.131*		-0.161		-1.114*		-0.635		-0.595*		0.389
		(2.95)		(0.39)		(3.20)		(1.30)		(2.00)		(1.58)
Non-Core Member												
adult male, not head		-0.089		-0.445*		0.295		0.176		-0.077		-0.024
		(0.14)		(1.65)		(1.15)		(0.76)		(0.36)		(0.11)
adult female, not head or spouse		0.102		-0.152		-0.813*		0.542*		0.229		0.302
		(0.20)		(0.52)		(3.60)		(2.70)		(1.02)		(1.19)
Elderly Member												
male		-0.549		-0.914*		-0.154		0.400*		0.144		-0.055
		(1.28)		(4.48)		(0.85)		(2.16)		(0.65)		(0.28)
female		-1.215*		-0.378		-0.929*		0.253		-0.174		0.021
		(2.24)		(1.56)		(3.70)		(0.84)		(0.76)		(0.08)
Constant	1.040	1.301	0.019	0.381	0.628*	0.760*	0.244	0.055	-0.550	-0.603	0.607	0.627
	(0.78)	(1.00)	(0.05)	(1.35)	(1.47)	(2.06)	(0.62)	(0.13)	(0.85)	(0.91)	(1.01)	(1.04)
Village×Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F-test on prime age mortality	0.10*	0.00*	0.00*	0.00*	0.00*	0.00*	0.16	0.03*	0.97	0.23	0.27	0.40
R-squared	0.091	0.103	0.084	0.100	0.105	0.119	0.085	0.093	0.076	0.080	0.112	0.113
Number of households	1,422 Households											

Source: Tegemeo Institute (Nairobi)/Michigan State University Agricultural Monitoring and Policy Analysis Household Surveys in 1997 and 2000.
Note: * indicates significance level at 10 %. Numbers in parentheses are t-ratios calculated with Huber-White-robust standard errors.

Table 3. The Impacts of Adult Mortality on Cultivated Land (OLS with village×time dummies)

Effects of Mortality of:	Area under cultivation (ha)				Assets			
	Δ Total Area Cultivated	Δ Cereals [a]	Δ Root crops [b]	Δ High-value crops [c]	Δ(Values of farm equipments)	Δ(Values of small animals)	Δ(Values of cattle)	Δ(Off-farm income)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Prime Age Core Member								
male head of household	0.188	0.412	0.699	-0.923**	-1,671	-73.12	17,288**	-43,081*
	(0.80)	(0.70)	(0.94)	(2.66)	(0.49)	(0.03)	(2.03)	(1.86)
female head or spouse	-2.241*	-1.889*	-0.396	0.044	-1,700	-7,589	-9,339	-74,505
	(1.73)	(2.00)	(0.54)	(0.09)	(0.30)	(0.95)	(0.93)	(0.87)
Prime Age Non-Core Member								
male, not head	0.370	0.931*	0.211	-0.773*	-4,977*	-5,986	-8,562	19,999
	(0.61)	(1.77)	(0.62)	(1.79)	(1.75)	(1.26)	(0.97)	(1.11)
female, not head or spouse	0.193	0.397	-0.321	0.117	-110.7	-3,480**	-4,263	-14,920
	(0.31)	(0.88)	(1.19)	(0.35)	(0.04)	(2.43)	(0.76)	(0.73)
Elderly								
male	-0.302	0.104	-0.099	-0.307	-2,622	-3,512*	-1,220	-30,047*
	(0.73)	(0.37)	(0.32)	(1.14)	(0.62)	(1.86)	(0.17)	(1.81)
female	0.856	0.655	0.231	-0.030	1,974	485.7	-3,840	-13,116
	(1.41)	(1.39)	(0.69)	(0.10)	(0.85)	(0.35)	(0.72)	(0.58)
Constant	-0.610	-1.105*	-0.621	1.117**	922.2	2,238	-8,911	-124,619**
	(0.67)	(1.74)	(1.21)	(2.07)	(0.51)	(1.17)	(0.90)	(2.92)
Village×Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Joint significance test (F stat)								
on PA mortality variables	0.89	2.18*	0.75	2.43*	0.82	2.80*	1.70	1.44
R-squared	0.140	0.130	0.110	0.155	0.127	0.134	0.162	0.147
Number of observations	1,422 Households							

Source: Tegemeo Institute (Nairobi)/Michigan State University Agricultural Monitoring and Policy Analysis Household Surveys in 1997 and 2000.
Note: Numbers in parentheses are t-ratios calculated with Huber-White-robust standard errors.
* indicates significance level at 10 %. ** indicates significance level at 5 %.
(*a*) Cereals include local maize, hybrid maize, beans, sorghum, millet, wheat, banana, and other minor cereals.
(*b*) Root crops include cassava, arrowroots, yams, sweet potato, and peas.
(*c*) High-value crops include coffee, tea, sugarcane, french beans, Irish potato, vegetables, and fruits.

[1] These surveys were designed and implemented under the Tegemeo Agricultural Marketing and Policy Analysis (TAMPA) Project, Egerton University/Tegemeo Institute, Nairobi, Kenya.

[2] We define a household member as a person who has lived on the household compound for more than six of the past 12 months.

[3] Predicted mortality for a particular age category is determined as AMR*PY, where AMR is adult mortality rates among the HIV-negative age/sex cohort in the Tanzanian sample and PY is the number of person years covered in the Urassa et al (2001) survey.

[4] All monetary values in this paper are expressed in constant 2000 Kenyan shillings.